

REMARKS/ARGUMENTS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 1-5 are presently active in this case, with Claim 5 added and Claims 1-2 amended by way of the present amendment.

In the outstanding Official Action, Claim 1 was rejected under 35 U.S.C. § 102(b) as being anticipated by Sato et al. (U.S. Patent No. 4,626,174). Claim 1 was also rejected under 35 U.S.C. § 102(b) as being anticipated by Freudenreich et al. (U.S. Patent No. 1,749,528). For the reasons discussed below, the Applicants respectfully request the withdrawal of the art rejections.

Claim 1 of the present application advantageously recites a gas turbine blade having a wide turning angle wherein the diameter of circles inscribing the belly side and back side of adjacent blades decrease gradually from the front edge to the rear edge. In particular, the blade of the present invention has a wide turning angle of more than 120 degrees which is suitable for a heavy duty and high load (with the pressure ratio of 20 or more, for example) gas turbine (page 7, lines 18 - 21) , and particularly for a high temperature gas turbine (with an inlet gas temperature of 1400 degrees Celsius or more for example) as described on page 2, lines 10 - 13 of the specification. Support for the amendment to Claim 1 can be found at least at page 7, lines 18-21, where the specification discloses an exemplary range of turning angles between 115 and 150 degrees.

As shown by the Abstract of the cited reference, Sato et al. describes a blade having a turning angle of 112 to 120 degrees, where the angles described by Sato et al. are converted into the corresponding influent and effluent angles described by the Applicants. The conversion of angles is based on the inlet angle range of 35-40 degrees and outlet angle range of 25-28 degrees disclosed by Sato et al. (See Abstract and Fig. 5, Sato et al.). These ranges

convert to influent and effluent angles of 50-55 and 62-65 degrees, respectively, according to the present invention (See Fig. 1, α_3 , α_4 in the specification). Accordingly, Sato et al. does not disclose a wide turning angle of more than 120 degrees, and thus does not anticipate Claim 1.

Thus, the Applicants respectfully request the withdrawal of the anticipation rejection of Claim 1 based upon the Sato et al. reference.

Turning to the rejection of Claim 1 under 35 U.S.C. § 102(b) as being anticipated by Freudenreich et al., the Applicants submit that the prior art reference cited does not disclose the feature of Claim 1 describing a gradual decrease in the passage width from the front edge to the rear edge.

Freudenreich et al. describe their steam turbine blade arrangement as [emphasis added]:

“quite wide at the entrance side, in comparison to the entire extent of the passage in the axial direction. It will be observed furthermore, that the channel continues as relatively wide from the entrance opening throughout somewhat more than one-half of its total extent, on the axial line on the machine (perpendicular to lines M and N) finally contracting abruptly to a much narrower form at the exit side. This contracted exit portion of the passage, which we will designate the velocity portion, is comparatively short in respect to both the total length of the passage and the exit portion of the previous standard design, which is illustrated in Fig. 3.”

- Column 3, lines 1-15

Furthermore, Freudenreich et al. summarize their blade arrangement as “a pressure portion, which is relatively wide, an exit portion which is narrow and quite short, and an intermediate contracting portion in which the directional flow changes rapidly” (Column 3, lines 15-20, emphasis added).

As the Freudenreich et al. reference does not disclose all the limitations recited in Claim 1 of the present application, namely the gradual decrease in passage width between

blades, the Applicants respectfully request the withdrawal of the anticipation rejection of Claim 1.

Claims 2-4 are considered allowable for the reasons advanced for Claim 1 from which they depend. These claims are further considered allowable as they recite other features of the invention that are not disclosed, taught, or suggested by the applied references when those features are considered within the context of Claim 1, thereby rendering the obviousness rejections of Claims 2-4 moot.

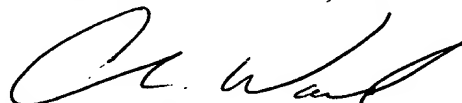
Newly added Claim 5 is considered allowable because neither Sato et al. nor Freudenreich et al., either alone or in combination, teach all the limitations recited within Claim 5. A rejection of the claim as unpatentable over Sato et al. in view of obvious design choice is respectfully submitted to be untenable when the following discussion is considered.

The gradual decrease of the inscribing circles results from a combination of two conditions, where the first condition is that the ratio of the maximum wall thickness to the blade chordal length is about 0.15 or more, and the second condition is that the wedge angle of the rear edge of the moving blade is 10 degrees or less. These two conditions are included in Claim 5 of the present amendment. As described in the specification at page 9, line 16 - page 10, line 16, the impact of the aforementioned two conditions is that the passage defined by inscribed circles between adjacent moving blades gradually decreases in diameter, and this relationship is determined geometrically. Moreover, Figure 8 graphically depicts the impact of constraining the dimensions of the blade on the passage width. As described in the specification, the passage width is characterized by a more gradual decrease represented by a correction of the single-dot chain line to the solid line of Figure 8 (Fig. 8, page 10, lines 5-15). Such a relationship between blade dimensions is not disclosed in the cited references and offers a unique advantage. Thus, a rejection of Claim 5 based upon obvious design choice would be unfounded.

Consequently, in view of the above discussion, it is respectfully submitted that the present application is in condition for formal allowance and an early and favorable reconsideration of this application is therefore requested.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.



Gregory J. Maier
Attorney of Record
Registration No. 25,599
Christopher D. Ward
Registration No. 41,367

Customer Number

22850

Tel: (703) 413-3000
Fax: (703) 413 -2220
(OSMMN 08/03)

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